Russian power sector reform: lessons for developing countries

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Abstract

The article takes a look at the issues of the market-oriented power sector reform and the experience that is of interest in the process of reforms in any country. Organizational models might, however, vary quite substantially in different countries in terms of basic characteristics.

The article studies the difference between idealistic notions that underlie the existing market model and real economic relations that are directly connected to the technological features of the industry. It validates proposals for alternative energy market models and a management mechanism for the industry.
Keywords: power sector reform, energy market, electricity prices.

1 Introduction

Over the past ten years, profound market transformations have been accomplished in Russia's electric power sector. A complex energy market infrastructure has been created; vertically integrated utilities have been unbundled and new joint-stock companies have been established in various areas of business; a whole cluster of market-oriented professionals has emerged. Nevertheless, the changes in the industry have not been supported by the public.

Analysis shows that a number of serious mistakes were made when implementing the transformations.

The qualitative characteristics of the macroeconomic environment that the industry exists in were ignored. The environment has so far been extremely ineffective; it is determined by a very bad investment climate and an underdeveloped finance and credit system; a considerable impact of external factors on electricity prices; the low capacity of mass market consumers to pay;

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the lack of a full-fledged market in the fuel industries and power plant engineering; a frequent change of the rules of operation on the energy market that confuses market participants.

A forward-looking decision about the target model of a market-driven power sector reform that was based on international experience has proved to be irrelevant due to the lack of a developed competition environment, a Russia-specific trend towards establishing affiliated businesses; manufacturers lacking interest in providing maintenance support services and, as a result, an influx of unqualified market participants [1].

When a spot market was introduced, conditions had not been created for its effective functioning. These include the availability of surplus capacity as a prerequisite for competition; the removal of operation and transmission constraints; the elimination of the capacity structure impact on prices; the feasibility of decommissioning uncompetitive power plants. For example, in some networks with a high share of hydroelectric power plants, coal-fired thermal power plants determine the marginal cost of production, artificially boosting the cost efficiency of hydropower plants.

There was an idealistic view of the market behaviour of business entities (owners, investors, consumers). It was naive to think that the management would be guided by signals from the competitive market, and in the first place, from the "day ahead" market.

It was a wrong decision to grant thermal power plants, nuclear power plants and heat and power plants privileged access to the spot market (day ahead market) and in competitive bidding for power supply, with their fixed costs being covered centrally.

It was also a mistake to exaggerate the readiness of state regulators and industry governance to resolve the key contradiction – between maintaining the appropriate level of reliability and pursuing a profit.

2 The issue of electricity prices

The author holds the following opinion on the issue of electricity prices that is fairly painful for Russia.

1. Regulation, no matter how thorough and transparent it is, can never fully replace cost competition; it can only supplement a free price system.
2. It is economically inappropriate to directly compare electricity prices (tariffs) with those in other countries. Only comparable cases can be considered, but they are effectively nonexistent.
3. The battle for "low" prices leads to extremely negative consequences. First of all, to investment degradation of energy suppliers: they are unable to attract investment in their modernization and development programmes (if government subsidies or tax concessions are unacceptable, as is the case in Russia, and cheap credit is not available or limited). Secondly, low prices definitely discourage energy efficiency, which is a major problem in Russia; there is no doubt about

that. Thirdly, amid overall inflation as well as rising fuel (gas) prices and the increasing cost per 1 kW of installed capacity, price controls are fraught with dangerous consequences in the short run: an inevitable price explosion for all consumers. It would be much harder to cope with than a more or less steady (continuing) price growth.

4. The level of electricity prices is determined by country-specific factors such as:

- the structure of generation capacity and fuel mix; power grid parameters and layout;
- the rate of concentration in production and centralization of management;
- the organizational and economic model of the market for electricity, capacity, maintenance and other services;
- the intensity of competition and its structure on the market;
- the accepted methods and effectiveness of price controls;
- sources of funding to cover investment costs.

On the other hand, a price growth occurs, for example, due to high inflation in the country, growing prices of fuel for thermal power plants and a higher per-unit cost of construction of energy facilities (as a result of growing domestic and world prices of equipment and materials).

Consequently, a price growth caused by external factors can undermine any attempt to bring prices down using organizational tools (such as restoring a vertically integrated structure, expanding tariff control areas etc.). By the way, the cost-driven optimization of load management will be of little help if surplus generation is not maintained at the level that is required for dispatch decisions (there is an obvious parallel with the spot market mechanism).

5. The optimal electricity price should be calculated with the help of such criterion as the nominal payback period for investment in advanced energy technologies that are acceptable for potential investors in the field of energy production and transmission as well as in the field of energy consumption. If the calculated payback period for a new cutting-edge power plant considerably exceeds the benchmark, the price can be considered too low and as hampering the development of the industry. On the other hand, if the payback period of energy conservation projects is too short compared to the benchmark, it means that the price is too high and that it will hold back the introduction of progressive power intensive technologies in manufacturing, i.e., the expansion of electrification.

3 Investment shortage

Many problems of the Russian electric power industry are rooted in the lack of effective investment risk management. It is a set of measures aimed at reducing investment risk and distributing it fairly among the market participants: owners of energy facilities, electricity consumers and the state.

In a basic market model, the main part of the risk lies with private business. As it did not work out in the general case, attempts are being made to pass off the risk to consumers, hoping for "fair" state regulation of prices (tariffs). In this case two scenarios seem most probable: the industry will either be stripped of funds not only for its development, but also for staying operational, or tariffs will start to grow rapidly, blocking economic growth. The advocates of this approach should be reminded about the experience of rigorous state regulation of the electricity sector (that operates in a highly effective market environment) in the USA where comprehensive control over utilities' costs and income was criticized for being too expensive, subjective and sluggish [2].

Apparently, the most logical solution would be *to find a rational distribution of risk*, although the task will be hard to be accomplished overnight and in full. The best way would be to distribute the relevant types of risk between the state and electricity businesses, relieving consumers of these costs that add to prices (as consumers already take a risk when they choose suppliers).

Thus*, a certain part of investment risk should be taken on by the state* in two aspects: a) by guaranteeing and stimulating private investment; b) through direct funding of individual investment projects (a strictly limited number). There arises a question about sources of financing. One must not be guided by the government budget (i.e., tax payers' money) only due to political as well as social and economic reasons. It would be reasonable to opt for raising funds from individuals and organizations in the form of energy bonds (which will be repaid from future electricity sales revenue). (This source of financing should, of course, not be viewed as the only, but a priority one.) But there are two difficult problems: that of ensuring truly attractive borrowing conditions and of people's trust in state institutions. The latter problem is a key one that needs to be worked on intensely through all communication channels.

The priority areas for spending the raised funds are on guaranteeing and encouraging investment in modernization, overhauls and new capacity. It is recommended that special attention should be paid to various *small and medium-sized power generating facilities* that position themselves as independent generators.

4 Regional factor

Conditions for the development and operation of the electricity sector in Russia vary regionally a lot more than in any other country. It shows in different structures of generation capacity, consumption, energy intensity of manufacturing, electric power systems, etc.

The pace of economic growth in the regions might vary (from growth to recession). Consequently, electricity grid load will be different: some regions will have an energy surplus, while others will have a capacity deficit. As a result, the attitude to energy efficiency among consumers will be different. For regions that enjoy economic growth energy conservation and demand-side management will be of major relevance. Others will have surplus capacity and will need to reallocate energy, which will require reinforcement of intergrid connections.

Different energy market models and state regulation policies will need to be adopted, too.

5 Prospects of the established energy market model

The author believes that one should not abandon the basic principles of the adopted market model, but it needs to be made more flexible in certain aspects. For example, if the purpose is to make access to the market open and nondiscriminatory for participants, the established spot market should essentially be preserved as the most democratic. At the same time it is possible to discuss its suitable scale in various regions, the structure of generators in terms of their homogeneity, the pricing mechanism, consumers' involvement and regulation principles.

More or less the same can be said about the capacity market. One should understand that on an organized market it is necessary to somehow cover the fixed costs of generators, especially if spot market bids only incorporate variable costs.

For the capacity market not to discredit itself as yet another failed innovation, it is necessary, first of all, to ensure its optimal interconnection with the electricity market (spot market). Minimized capacity and electricity charges for bulk buyers will be a tangible proof of it.

What is undoubted is the focus on developing *a market for non-regulated bilateral contracts* for the supply of electricity and capacity. Exchange-traded contracts are of particular importance here due their highest degree of protection.

As for the situation with retail markets, it seems most likely that in the foreseeable future some retail markets will remain practically monopolistic, that is, regulated as refers to electricity retailers. Indeed, in the current Russian setting it is better to have one major financially stable and socially responsible power supply company, than several dubious "young" suppliers imitating competition. When necessary external prerequisites emerge, the markets could also be liberalized.

Nevertheless, free prices for electricity and capacity should fully spread from the wholesale market to the retail one. An exception should be made for low-income households and a limited group of socially important customers for whom the regulator will set discounted prices, with the concession being covered with public funds. Regional electricity retailers should be rewarded for signing bilateral contracts with generators at prices that are lower than those on organized electricity and capacity markets. At the same time, it is necessary to increase the range of end users who are granted the status of wholesale market participants.

We should note that positive changes in the external environment such as growth in personal income, energy conservation efforts and higher profitability of non-energy business will help to reduce regulation on the wholesale and retail markets, "switch" the market into full operation mode and realize the potential of social efficiency that is incorporated in the target energy market model.

6 Taking account of the Russian experience in developing countries

The development of competitive markets for the electric power industry is a global progressive trend. It is commonly believed that it boosts private investment and at the same time optimizes electricity prices as well as ensures rational consumer choice. Country-specific models of the sector's organization, however, differ quite drastically in terms of:

- the readiness level in the external environment;
- ownership of energy assets;
- the level of vertical integration in power companies;
- peculiarities of price and investment regulations;
- competition mechanisms;
- the ability of consumers to freely choose a power supplier.

The electricity market is universally an artificial construction based upon various organizational and economic models that are designed and implemented under the aegis of national governments.

Investment inertia of energy facilities, security of electricity supply and the political expediency of industry regulation (environmental and social) are the factors that restrict the flexibility of the electricity market and limit the scale of liberalization of the energy markets (compared to conventional naturally competitive commodity markets).

Implementing one or another energy market model requires certain economic, technological and social prerequisites. For example, in order to create a competitive environment, it is necessary to constantly maintain capacity surplus on the wholesale market; ensuring the uninterrupted and smooth operation of the market requires modern up-to-date software, IT and telecommunication solutions.

The quality of the economic environment has a particular importance. It is determined by such key parameters as the overall investment climate in a country, the development of competition on commodity markets supplying resources to the electric power generation industry; the population's purchasing power; the professional competence of workers. The predominantly negative experience of the Russian power sector reform offers tangible proof of the need to adhere to these parameters [3].

Over the past few years, technological innovations have emerged or are being designed in the electric power industry of some developed countries that will probably require relevant adjustments to the existing electricity market models. To be more precise, these are distributed generation (especially based on renewable energy sources) and “smart” grid projects. For example, RES that are uncompetitive economically, but environmentally friendly are given priority when the system operator dispatches generating units, which, by the way, ruins the entire mechanism of competitive pricing on the wholesale market.

When choosing an energy market model, it is advisable for developing countries to preserve to a certain degree the vertically integrated structure of functions in electric power companies (in the limit – in the form of a holding

company). At the same time, special attention should be paid to competition in the field of building new generation assets (i.e., in investment), rather than in operation.

Of all other common options, the "single buyer" ("purchasing agency") model appears to be the most suitable one for developing markets. The role of the single buyer is played by a partly integrated national utility company; it is this company that organizes competition among generators and independent producers on the wholesale market.

As the introduction of a market system in the electric power industry fell short of expectations, in many countries there has been an increased interest in microgeneration, distributed generation (RES, gas turbine units, reciprocating engine units, small steam turbine plants, NPPs of up to 150 MW). Such power production makes it possible to bring down the cost per unit, put new assets into operation, has a short payback period, it is reliable and flexible. At the same time, a number of negative occurrences could be observed.

The place and functions of microgeneration in the power sector of a country is yet to be determined, and more importantly, institutional mechanisms for managing its development have not been devised and adopted. As a result, the development of microgeneration (distributed generation) has so far been spontaneous and sporadic and is mainly driven by the enthusiasm of local authorities and head of companies who are all trying to address of the issue of power supply in their own way.

A lot is being said today about the technical and economic advantages of various small units, but there have been practically no systemic proposals for exploiting the combined efficiency potential of microgeneration as an element of the country's electric power sector.

Microgeneration should be viewed as a progressive technical base for building a regional power production framework that carries out a set of anti-crisis tasks in power supply amid numerous risks brought about by the liberalization of the electricity market.

When reforming the electric power sector, special attention should be paid to the training of qualified managerial personnel. An influx of managers who are not familiar with the basics of energy technology, who lack the understanding of its most complex interdisciplinary relationships with business results and of the priority of the security of supply leads to a sharp decline of professionalism in the sector management and negative consequences.

7 Conclusion

The author has defined and validated the main reasons why the power sector reform in Russia led to unsatisfactory results.

On the basis of these causes, areas for improvement of competition and market environment have been determined and proposed models of the industry development have been substantiated.

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